Preface

Overview

Basic Electronics is a common course for all engineering disciplines. Students of all engineering disciplines, particularly non-electrical engineering disciplines, find it very difficult to understand the basic concepts of this subject. Most of the currently available textbooks provide high-end information, but fail to provide elaborate and detailed explanation on most topics. Also, there is *no single book* that covers the entire syllabus of any university and provides all the necessary information.

Even for the students of electrical engineering disciplines, there is a need for catering to strong fundamentals, so that they can be more comfortable at higher semester levels. Most current titles have not given enough scope for the basics. Hence, a thorough attempt has been made to cover the entire syllabus in one book, with a lot of emphasis on basics. This text covers the Basic Electronics syllabi of more than 12 different leading universities of India. Much effort has been made to present the information in a lucid and easily understandable way, so that it is effective for the students at the first/second semester levels. Also, the content is designed to help all classes of students at lower and even in higher semester levels.

Aim of the Book

This book mainly intends to be a text for a first course in electronics of all electronics and electrical sciences students. The text grows around the electronics first-course syllabi offered at various technical and science universities. The book aims to cater to the needs of mainly undergraduate students—providing the internal behaviour of important electronic devices, the principles of operation and design concepts, and analysis of circuits/systems built using these devices.

Many available books on the first course on basics of *electronic devices* and *principles of circuit theory* require significant improvements in pedagogy and content. This book is an attempt to cater to the changing curriculum and examination requirements—primarily to improve the manner in which the material is presented.

About the Book

I have given considerable thought to the pedagogy of presentation: the **system of notations** is consistently maintained, the **circuit behaviour** is explained with in-depth coverage, and the worked-out **illustrative examples** provide detailed insight to the subject. The **diagrams** present a thorough understanding of the concepts, and the **tables** are carefully prepared to illustrate the topics. The **chapter summary** helps the reader recall the concepts studied after each chapter. The **multiple-choice questions** are prepared with an intensive coverage, meant to create increasing confidence in the reader. The quiz offers **short answers to questions** framed to increase readers' knowledge on the concepts and subject. All these elements summarise the concepts taught and help in future review.

Salient Features

- **Complete coverage of subject** as per requirements of all technical universities and science colleges
- **Elaborate coverage, lucid presentation** and **easy flow** maintained
- Stress on the **foundation principles of electronics**
- **Applications of fundamental principles** interspersed within the content
- **Important topics** like LED Characteristics, MOSFET, Power Semiconductor Devices, Feedback Amplifiers and Oscillators, Shift Registers and Counters discussed in detail
- **Goals and objectives** at the beginning, and chapter-end **Summary** provided for each chapter
- Helpful guide for **competitive examinations**
- Numerous **block diagrams** and **circuit diagrams** to enhance understanding
- Pedagogy includes
  - 300 Diagrams
  - 320 Solved Examples
  - 450 Multiple-Choice Questions
  - 225 Review Questions
  - 185 Problems
  - 250 Short-Answer Questions

Chapter Organisation

The book is organised into 10 well-designed chapters, covering almost all the needs of a first course in electronics. The overview of each chapter is outlined below:

Chapter 1 covers the fundamentals of semiconductor physics, charge carriers in semiconductors and doping concepts. The *PN*-junction formation, its behaviour under different biasing conditions, characteristics and equivalent circuits are discussed.

Chapter 2 deals with the fundamentals of a semiconductor *PN*-junction diode, its characteristics and load-line analysis. All important applications of junction diodes such as rectifiers, voltage multipliers, wave-shaping circuits and basic logic gates are covered with maximum care. The other sub-systems of power supply, such as filters and regulators, are also designed and analysed.

Chapter 3 presents another very important semiconductor three-terminal device, the Bipolar Junction Transistor (BJT). The fundamentals of device construction, characteristics, and configurations of operation are covered. Different biasing methods and applications of BJT are covered to a large extent.

Chapter 4 introduces applications of BJT such as amplifiers, oscillators and feedback concepts. Amplifier classification, design analysis, feedback concepts, effect of feedback on the performance of BJT circuits is discussed. Oscillator classification and design analysis are also presented in this chapter.

Chapter 5 explains fundamentals of communication, modulation/demodulation methods and their performance comparison. The chapter also discusses radio and television communication applications.

Chapter 6 covers fundamentals of important linear integrated circuits such as operational amplifier, timer and Phase-Locked Loops (PLLs). The internal architecture, characteristics and useful applications of these devices are discussed. The worked examples, multiple-choice questions and chapter-end summary aims to make the reader more confident in using these ICs in real-life applications.

Chapter 7 presents the fundamentals of switching theory and logic design, covering basics to real-world applications, both in combinational and sequential systems. Applications such as arithmetic circuits, latches, flip-flops, registers, counters, etc. are also discussed.

Chapter 8 deals with fundamentals of measuring and display instruments. Measuring instruments like voltmeters, ammeters, multimeters and display instruments like cathode ray oscilloscopes are discussed in this chapter. Measurements such as frequency and phase angle for signals are covered thoroughly.

Chapter 9 explains fundamentals of transducers. In real-world applications, transducers play a vital role and the chapter provides a very good introduction for readers.

Chapter 10 covers fundamentals of other very important semiconductor devices such as Field Effect Transistors (FETs), Metal Oxide Semiconductor FETs (MOSFETs), Unijunction Transistors (UJTs), etc. The fundamentals of device construction, characteristics, and configurations of operation are dealt with. Different biasing methods and applications of FETs are discussed to a large extent. Silicon Controlled Rectifier (SCR), another very important semiconductor device that finds strong applications in power electronics, is also presented in this chapter.

Considerable efforts have been put in to the layout of different chapters, preparation of the material and of presentation pedagogy. A large variety of exercise problems provided at the end of each chapter will certainly help the reader develop strong fundamental knowledge. I expect and hope that all readers would highly benefit from these pedagogical features during self-study. Budding engineers will find the text very useful in updating their knowledge base.

Online Learning Centre

The text is accompanied by an exhaustive Online Learning Centre which can be accessed at https://www.mhhe.com/aradhya/be1

This website contains the Solution Manual and PowerPoint Lecture slides.

Acknowledgements

First, I thank all the reviewers responsible for making the text acceptable to a large user community. Their names are given below:

Padma Batra	*Krishna Institute of Engineering and Technology (KIET), Ghaziabad, Uttar Pradesh*
Achint Chugh	*Jagadguru Sri Shivarathreeshwara Academy of Technical Education, (JSSATE), Noida, Uttar Pradesh*
A K Sen	*Kalinga Institute of Industrial Technology (KIIT) University, Bhubaneswar, Odisha*
Rajesh Thakker	*Vishwakarma Government Engineering College, Ahmedabad, Gujarat*
Nilesh Patel	*Laljibhai Chaturbhai Institute of Technology, Mehsana, Gujarat*
V N Chavda	*Government Engineering College, Modasa, Gujarat*
Sunil U Nyati	*Shrama Sadhana Bombay Trust's College of Engineering and Technology, Jalgaon, Maharashtra*
Shriniwas Annasaheb Patil	*Textile and Engineering Institute, Kolhapur, Maharashtra*
R Shankar	*Gnanamani College of Engineering, Namakkal, Tamil Nadu*
B Ramani	*SSN College of Engineering, Chennai, Tamil Nadu*
R Pandian	*Velammal College of Engineering and Technology, Madurai, Tamil Nadu*
K M Siva Kumar	*Coimbatore Malayali Samajam College of Engineering and Technology (CMSCET), Coimbatore, Tamil Nadu*
Sivadanam Bharath Kumar	*NBKR Institute of Science and Technology, Vidyanagar, Andhra Pradesh*
P M Chandrashekharaiah	*Shridevi Institute of Engineering and Technology*, *Tumkur*, *Karnataka*
S Jagannathan	*RV College of Engineering, Bangalore, Karnataka*

Thanks are also due to the student community and my teachers who made *me* a teacher. I sincerely acknowledge the contribution of my family who supported the cause largely. In this regard, my wife, Smt. Vijayalakshmi, who is a source of inspiration in all my endeavours, deserves a special mention.

I thank the McGraw-Hill Education team, who made my dream a reality—Shalini Jha, Koyel Ghosh and Sohini Mukherjee—for their constant support, and excellent interaction. I am also grateful to my family members who supported me in all stages of preparation of this text.

Ravish Aradhya HV

Publisher's Note

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Piracy-related issues may also be reported!